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Dr. G. K. Kulkarni,
Siemens Ltd., Kalwa Works,
Thane-Belapur Road, Thane - 400 601
Tel: +91 22 2760 0111 / 2762 3217
Fax: +91 22 2762 3730

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Dr. G. K. Kulkarni
editor@ijoem.com, ganesh.kulkarni@siemens.com

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drskartikeyan@rediffmail.com

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Reliance Industries Ltd., Reliance Centre, Walchand Hirachand Marg, Mumbai - 400 038, India
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Climate change: The challenges for public health preparedness and response- An Indian case study

Abstract

Extremes weather changes surpassing their usual statistical ranges and tumbling records in India could be an early warning bell of global warming. Extreme weather events like the recent record setting in western Indian city of Mumbai or all time high fatalities due to the heat wave in southern Indian states or increasing vulnerability of eastern Indian states to flood could all be a manifestation of climate change in the Asian subcontinent. While the skeptics may be inclined to dismiss these events as simple local aberrations, when viewed in an epidemiological paradigm in terms of person, time and space couple with frequency, intensity and fatalities, it could well be an early manifestation of climate change. Global warming poses serious challenge to the health sector and hence warrants emergency health preparedness and response. Climate-sensitive diseases are among the largest global killers, hence major brunt of global climate change in terms of adverse health impact will be mostly borne by poor and developing countries in Asia, given the levels of poverty, national levels and poor public health infrastructure.

Key words: Climate change, global warming, health impact, health emergency, preparedness

above normal,^[1] leading to a heatwave. Speaking of heat wave, the 1998 heat wave in Orissa was recorded as one of the worst, claiming more than 2000 lives.^[2] 1998 was the warmest year globally.^[3]

Extremes of climatic changes surpassing their usual statistical ranges and tumbling records in India should be an early alarm to all of us to sit back and take notice. Extreme weather could be a manifestation of global climate change and global warming.

We are not insisting that the record-breaking Mumbai rain or heat waves in Orissa have a direct causal association with global warming /global climate change but at the same time, we should also not ignore them as “simple local aberrations”. Extreme weather events such as severe storms, floods and drought have claimed thousands of lives during last few years and have adversely affected the lives of millions and cost significantly in terms of economic losses and damage to property. Just to take few examples: Floods are an annual feature in Bihar, but the 2004 floods were unique for its severity. Andhra Pradesh reeled under heat wave in 2003 killing 1,421 people, which is an all-time high in the history of Andhra Pradesh.^[4] Orissa is no stranger to cyclones but the 1999 cyclone was again unprecedented for the sheer severity with wind speed reaching over 300 km per hour leaving nearly 10000 dead and has gone down in history as the Super cyclone.^[5] Cheerrapunjee, the world's wettest place is going through a rare rain crisis and is experiencing dry spells. This

**Rajan R. Patil,
T. M. Deepa**
Dept. of Health, UNDP,
UN-House-II, Orissa,
India

For correspondence:
Dr. Rajan R. Patil,
Shambhu Apartment
Ground Floor,
Adarsh Nagar,
Hubli, Karnataka,
India.
E-mail: rajanpatil@yahoo.com

INDIAN CASE STUDY

The Indian metropolitan city of Mumbai was besieged with India's heaviest downpour of the century in July 2005, killing nearly 600 people. According to the Indian Meteorological department, was the heaviest ever rainfall received in a single day, any where in India recording 94.4 cm in the last 100 years. It broke the record of previous highest rainfall at one place in India at Cherrapunjee in Meghalaya of 83.82 cm recorded on July 12th, 1910.^[1] Cherrapunjee in the North Eastern state of Meghalaya is a generally wellknown for being the wettest place in the world.

In the same year, there was another record broken in Eastern Indian state of Orissa, for unusual mercurial rise in summer, June 2005 recorded the highest temperature of 46.3 degree Celsius in Bhubaneswar of the last 33 years which is 10 degrees



year while Mumbai was being flooded, Cherrapunjee received less than average rain fall in June and July with distressing situation subsequently. According to the meteorological department officials the unusual pattern of rainfall can be attributed to the monsoon trough moving southwards from normal position of the Cherrapunjee-Assam-Bihar belt. The shift has caused more rains in Orissa and Maharashtra belt.^[1]

In addition to changing weather patterns, climatic conditions affect diseases transmitted through water and via vectors such as mosquitoes. Climate-sensitive diseases are among the largest global killers. Diarrhoea, malaria and protein-energy malnutrition alone caused more than 3.3 million deaths globally in 2002, with 29% of these deaths occurring in the Region of Africa.^[3]

No, we are not even saying that India is the only country taking the entire brunt of global warming. Of course all the countries are facing it, e.g., the 1995 Chicago heat wave killed nearly 600 people, French heat wave of 2004 killed 15, 000 people in a matter of a weeks.^[6] Like-wise in Fiji, the 1998 Dengue outbreaks are again said to be an evidence of global climate change, as the distribution of the vector (*Aedes polynesiensis*) is said to be affected by rise in the sea level, since it breeds in brackish water.^[7]

Recognition of the existence of the problem is the first step towards solution, rather than dismissing global climate change as conspiracy theory or hype created by environmentalists. It is important that we have these extreme events on our surveillance radar and verify them for being potential pieces of evidence from India for global climate change. Extreme climate events are expected to become more frequent in the coming years with climate change.

Let's face it; the major brunt of global climate change in terms

of adverse health impact will be mostly borne by poor and developing countries, even though rich and industrialized countries account for maximum green house gas emission.^[3,8] Any region under stress, such as the Indian sub-continent, is likely to experience greater effects from these 'extreme weather' events, because of obvious reasons poverty, malnutrition, poor public health infrastructure etc.

In its Third Assessment Report (2001), the United Nation's Intergovernmental Panel on Climate Change (IPCC) stated: "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities" and concluded that: overall, climate change is projected to increase threats to human health, particularly in lower income populations, predominantly within tropical/subtropical countries.^[9]

A brief overview of likely health effects due to climate change (Figure 1) is discussed here.

DIRECT IMPACTS

The weather has a direct impact on our health. If the overall climate becomes warmer, there will be an increase in health problems. It is anticipated that there will be an increase in the number of deaths due to greater frequency and severity of heat waves and other extreme weather events. The elderly, the very young and those suffering from respiratory and cardiovascular disorders will probably be affected by such weather extremes as they have lesser coping capacity. An extreme rise in the temperature will affect people living in the urban areas more than those in the rural areas. This is due to the 'heat islands' that develop here owing to the presence of concrete constructions, paved and tarred roads. Higher temperatures in the cities would lead to an increase in the ground-level concentration of ozone thereby increasing air

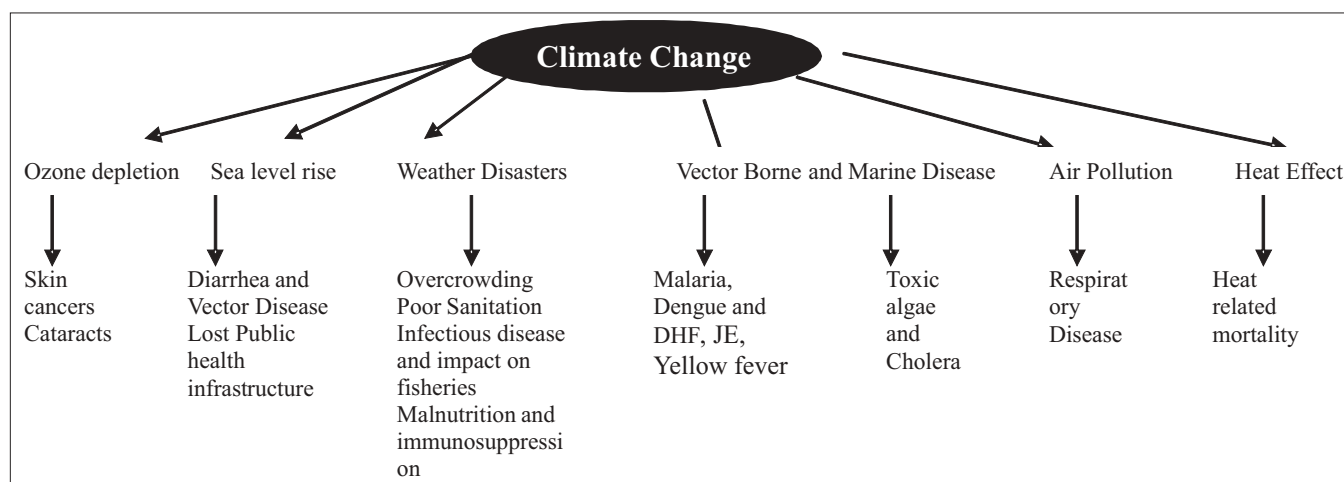


Figure 1: Possible health impacts due to climate change^[11]

pollution problems.

INDIRECT IMPACTS

Indirectly, changes in weather pattern, can lead to ecological disturbances, changes in food production levels, increase in the distribution of malaria, dengue and other vector-borne diseases. Fluctuation in the climate especially in the temperature, precipitation and humidity can influence biological organisms and the processes linked to the spread of infectious diseases.

The infections that will spread with climate change have some commonalities.^[10] They are focal and their distribution is limited by the ecology of their reservoir, be it arthropod, snail or water. They usually have a two or three-host life cycle, meaning that in addition to infecting people, they infect a vector and frequently also a wild vertebrate animal host. Either the vector or the host or both, are the reservoir. The range of the reservoir is delineated by temperature and sometimes water. If the agent and reservoir are successful in the newly warmer climate, the agent can be expected to multiply more rapidly and if the reservoir is an arthropod or snail, it too will develop more rapidly (it may also have a shorter life).

The risk of explosive epidemics due to vector borne diseases is enhanced because of two main properties of the vector-virus relationship. Firstly, within limits viruses multiply more rapidly in mosquitoes at high temperatures than at low ones. Secondly, the mosquito also develops more rapidly at high temperatures than at low ones. This combination is conducive to a very short incubation period in the mosquito and rapid mosquito population increase. A short incubation period in the mosquito along with rapid population increase in turn can lead to more rapid and sometimes explosive transmission in the human population. This prediction, however, should be accompanied by a caution. Warmer temperatures also lead to a shorter life span of the mosquito and shorter life means less time to transmit the virus to another person.

Among vector-borne diseases in India, malaria is of

considerable concern. Periodic epidemics of malaria occur every five to seven years and the World Bank estimates that about 577,000 DALYs (disability-adjusted life years) were lost due to malaria in India in 1998. Climate change could increase the incidence of malaria in areas that are already malaria-prone and also introduce malaria into new areas.

Potential effects on health due to sea level rise include:

- Death and injury due to flooding;
- Reduced availability of fresh water due to saltwater intrusion;
- Contamination of water supply through pollutants from submerged waste dumps;
- Change in the distribution of disease-spreading insects;
- Health effect on the nutrition due to a loss in agriculture land and changes in fish catch; and health impacts associated with population displacement

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